What is claimed is:

1. An underground mining method, comprising:

excavating *in situ* material in an underground excavation with a mining machine;

backfilling at least a portion of the underground excavation with a particulate material to define a trailing passage, wherein an area of a cross-section of the trailing passage is no more than about 30% of an area of a cross-section of the at least a portion of the excavation before backfilling; and

thrusting off of the backfilled particulate material to propel the mining machine forward.

2. The method of Claim 1, wherein the backfilled particulate material was previously excavated by the mining machine and the backfilled particulate material is unconsolidated after the backfilling step.

3. The method of Claim 1, wherein in the excavating step a movable shield is used to provide ground support during excavating and further comprising:

forming a tunnel liner under the movable shield to provide ground support for the trailing passage.

4. The method of Claim 1, further comprising:

removing from the underground excavation a first portion of the material excavated by the mining machine and wherein in the backfilling step a second portion of the material excavated by the mining machine is used as the particulate material.

5. The method of Claim 1, wherein the *in situ* material contains hydrocarbons and the *in situ* overburden material is sedimentary in origin.

6. The method of Claim 1, wherein in the backfilling step a form is positioned in the excavation and the backfilling step includes the steps of:

contacting the backfill material with a binder; and

placing the binder-containing backfill material around the form.

7. The method of Claim 1, wherein the area of the cross-section of the trailing passage is no more than about 20% of the area of the cross-section of the at least a portion of the excavation before backfilling.

8. An underground mining method, comprising:

removing *in situ* material from an excavation face in an underground excavation using a mining machine, the underground excavation having a cross-sectional area near the excavation face and in a direction transverse to a direction of excavation; and

forming at least a portion of the removed material into a consolidated liner between the excavation face and a surface opening of the underground excavation to define a trailing tunnel, the trailing tunnel having a cross-sectional area in a direction transverse to a direction of excavation that is no more than about 30% of the cross-sectional area of the underground excavation, wherein the consolidated liner remains stationary after formation.

9. The method of Claim 8,wherein the *in situ* material is at least one of coal, oil shale, oil sands, bauxite, trona, potash, and oil-containing materials and wherein cross-sectional area of the trailing tunnel is no more than about 20% of the cross-sectional area of the underground excavation.

10. The method of Claim 8, wherein the forming step includes:

contacting the removed material with a binder to form the consolidated liner and wherein the cross-sectional area of the trailing tunnel is no more than about 10% of the cross-sectional area of the underground excavation.

11. The method of Claim 8 further comprising:

transporting at least a second portion of the removed material to a processing facility located outside of the excavation; and

thrusting off of the consolidated liner to propel the mining machine forward.

12. The method of Claim 11, wherein the transporting step includes the step of forming the at least a second portion of the removed material into a slurry and hydrotransporting the slurry out of the excavation.

13. The method of Claim 12, wherein the transporting step includes:

placing at least a portion of the slurry in a surge tank.

14. The method of Claim 8, further comprising:

processing the removed material in the excavation to form the at least a portion of the removed material, the at least a portion of the removed material being waste from the processing step.

15. The method of Claim 8, further comprising:

sensing a type of unexcavated material ahead of the excavation face and wherein the sensing is performed using an active acoustic source.

16. The method of Claim 8, wherein the removing step includes:

advancing the mining machine; and

extending a telescopic, accordion, or flexible slurry pipeline as the mining machine advances.

17. An underground mining method, comprising:

(a) removing consolidated *in situ* oil sands from an excavation face in an underground excavation using a mining machine, the underground

excavation having a cross-sectional area near the excavation face and in a direction transverse to a direction of excavation;

(b) placing at least one of a liner and form between the excavation face and a surface opening of the underground excavation to form a trailing passage, the at least one of the liner and form having an outer periphery that is smaller in size than the excavation and remaining stationary after placement; and

(c) placing at least a portion of the removed oil sands between the at least one of the liner and form and a surface of the excavation.

18. The method of Claim 17, wherein the at least one of a liner and form is a liner and the liner is self-supporting and consolidated, wherein the liner remains stationary as the mining machine forming the excavation is propelled forward and, wherein a cross-sectional area of the trailing passage is no more than about 30% of the cross-sectional area of the underground excavation.

19. The method of Claim 18, wherein the cross-sectional area is no more than about 10% of the underground excavation cross-sectional area.

20. The method of Claim 17, wherein the placing step (c) includes:

transporting the removed oil sands away from the mining machine;

processing, at a location distant from the mining machine, the removed oil sands; and

transporting the processed oil sands from the distant location to the mining machine.

21. A continuous underground mining method, comprising:

removing consolidated material from an underground excavation face using a mining machine, the mining machine being located near the excavation face;

placing at least a first portion of the removed material behind the mining machine to form a trailing opening having a cross-sectional area transverse to a direction of excavation that is no more than about 30% of a cross-sectional area of the excavation transverse to the direction of excavation at the location of the mining machine;

removing at least a second portion of the removed material from the underground excavation.

22. The method of Claim 21, wherein the at least a first portion of the removed material is contacted with a binder before the placing step.

23. The method of Claim 21, wherein the removed material is processed within the mining machine and the at least a first portion of the removed material is waste of the processing step and wherein the second portion of the removed material is transported away from the mining machine to a processing facility.

24. The method of Claim 23, wherein the mining machine is a tunnel boring machine.

25. The method of Claim 23, wherein the material includes oil sands and the processing includes separating bitumen in the oil sands from the oil sands and wherein the trailing opening is formed by a consolidated liner that remains stationary as the mining machine is propelled forward.

26. The method of Claim 21, further comprising displacing the mining machine in the direction of the excavation by pushing against the at least a first portion of the removed material located behind the mining machine.

27. An underground mining method for excavating an oil sands-containing material, comprising:

passing a mining machine through the *in situ* oil sands-containing material to form a tunnel;

forming a consolidated liner in the tunnel behind the mining machine, the consolidated liner defining a trailing passage and remaining at least substantially stationary; and

placing a backfill material in the tunnel behind the mining machine and around the liner to provide ground support for the trailing passage.

28. The method of Claim 27, wherein the backfill material is unconsolidated and comprises at least a portion of the excavated oil sands-containing material and wherein the trailing passage has a cross-sectional area that is no more than about 20% of a cross-sectional area of the unlined tunnel.

29. The method of Claim 27, wherein the mining machine has a plurality of segments and further comprising:

displacing a leading segment forward by pushing against a trailing segment.

30. The method of Claim 29, further comprising after the displacing step:

pulling the trailing segment forward using the displaced leading segment.

31. The method of Claim 27, further comprising:

forming the liner in the tunnel formed by the mining machine, the liner including material excavated by the mining machine and being located behind the mining machine; and

displacing the trailing segment forward by pushing against the liner.

32. The method of Claim 27, wherein the mining machine forms, through the oil sands-containing material, a tunnel having a "U"-shape and wherein the tunnel is on one level.

33. The method of Claim 27, wherein the mining machine forms, through the oil sands-containing material, a plurality of overlapping "U" shaped tunnels, each of a pair of overlapping "U" shaped tunnels being interconnected by an adit and wherein the tunnel is on one level.

34. The method of Claim 32, wherein the tunnel has an approximately rectangular cross-section in a direction transverse to the long axis of the tunnel.

35. The method of Claim 32, further comprising:

determining the position of the mining machine using a global positioning satellite and a fibre optic surveying line that is maintained along the tunnel behind the mining machine.

36. The method of Claim 32, wherein the mining machine includes at least one cutting head.

37. The method of Claim 32, further comprising:

comminuting, in the tunnel, the excavated oil sands-containing material with a crusher to form comminuted oil sands;

transporting the comminuted oil sands from the tunnel to a processing facility located at a distance from the mining machine;

at the processing facility, removing hydrocarbons from the comminuted oil sands forming a hydrocarbon product and a solid waste material;

transporting the waste material from the processing facility to the mining machine, wherein the backfill material comprises the solid waste material.

38. The method of Claim 27, further comprising:

collecting methane gas in an atmosphere external to the mining machine; and

transporting the methane gas to the surface.

39. The method of Claim 27, further comprising:

spraying an excavation face with water during the passing step to form the excavated oil sands-containing material into a slurry;

transporting the slurry through the mining machine; and

when the slurry is in the mining machine, maintaining the slurry at a pressure from about 0.1 to about 3 atmospheres higher than a formation pressure of the *in situ* hydrocarbon-containing material.

40. The method of Claim 27, further comprising:

using fine particulate waste material derived from the oil sands-containing material as a lubricant in the mining machine.

41. The method of Claim 32, further comprising:

forming a tunnel liner in a tunnel behind the mining machine;

forming perforations in the liner;

sealing at least a section of the tunnel from an ambient atmosphere; and

introducing a gas into the at least a sealed section of the tunnel.

42. The method of Claim 32, further comprising:

installing a plurality of rock bolts into the oil sands-containing material accessible by the tunnel formed by the mining machine, wherein each of the rock bolts includes a passage for gases passing into or out of the oil sands-containing material.

43. The method of Claim 27, wherein the excavating step includes:

forming a first tunnel having a "U"-shaped bearing through the oil sands-containing material; and

thereafter forming a second tunnel having a "U"-shaped bearing through the oil sands-containing material, the first tunnel overlapping the second tunnel, wherein an excavation direction used to form the first tunnel is opposite to an excavation direction

used to form a corresponding part of the second tunnel and wherein the first and second tunnels are on a common level.

44. The method of Claim 27, wherein the mining machine is segmented and wherein the passing step includes the steps of:

advancing a first section of the mining machine forward, wherein the first section is advanced by pushing against an adjacent second section of the mining machine;

when the first section is advanced relative to the second section a selected distance, pulling, with the first section, the second section forward and pushing, with at least one trailing section, adjacent to the second section, the second section forward;

when the second section is advanced relative to a trailing section the selected distance, pulling with the first and second sections and pushing off the backfill material behind the mining machine to move the at least one trailing section forward; and

in the portion of the excavation formerly occupied by at least one trailing section, placing the liner.

45. The method of Claim 44, wherein the liner is placed in the portion of the tunnel as the trailing section is moved forward.

46. The method of Claim 4, wherein the second portion of the material is not removed from the excavation.

47. The method of Claim 1, wherein backfilled particulate material is not placed between the body of the mining machine and the adjacent wall of the underground excavation.

48. The method of Claim 20, wherein only a first portion of the removed material is in the first slurry and the processing step is performed outside of the

excavation and a second portion of the removed material is not removed from the excavation.

49. The method of Claim 17, further comprising:

propelling the mining machine forward by thrusting off of the removed material positioned between the at least one of a liner and form and the surface of the excavation.

50. The method of Claim 17, wherein removed material is not placed between the body of the mining machine and the adjacent surface of the excavation.

51. The method of Claim 49, wherein the removed material positioned between the at least one of a liner and form and the surface of the excavation is unconsolidated.

52. The method of Claim 27, further comprising:

propelling the mining machine forward by thrusting off of the backfill material positioned between the liner and an adjacent surface of the excavation.

53. The method of Claim 27, wherein backfill material is not placed between the body of the mining machine and an adjacent surface of the excavation.

54. The method of Claim 53, wherein the backfill material positioned between the at least one of a liner and form and the surface of the excavation is unconsolidated.

55. The method of Claim 24, further comprising:

propelling the mining machine forward by thrusting off of the removed material placed behind the mining machine.

56. The method of Claim 24, wherein removed material is not placed between the body of the mining machine and an adjacent surface of the underground excavation.

57. The method of Claim 55, wherein the removed material placed behind the mining machine is unconsolidated.

58. The method of Claim 21, wherein only the second portion of the removed material is removed from the underground excavation while the first portion of the removed material is not removed from the underground excavation.

59. An underground mining method for excavating a hydrocarbon-containing material, comprising:

(a) passing a segmented mining machine through the *in situ* hydrocarbon-containing material to form excavated material; and

(b) placing a backfill material behind the segmented mining machine to form a tunnel of reduced cross-sectional area, wherein the passing step (a) comprises the substeps of:

(i) advancing a first section of the segmented mining machine forward, wherein the first section is advanced by pushing against an adjacent second section of the segmented mining machine;

(ii) when the first section is advanced relative to the second section a selected distance, pulling, with the first section, the second section forward and pushing, with at least one trailing section, adjacent to the second section, the second section forward;

(iii) when the second section is advanced relative to a trailing section the selected distance, pulling with the first and second sections and pushing off the backfill material behind the segmented mining machine to move the at least one trailing section forward; and

(iv) in the portion of the excavation formerly occupied by at least one trailing section, placing a liner.

60. The method of Claim 59, wherein the liner is placed in the portion of the tunnel as the trailing section is moved forward.

61. The method of Claim 59, wherein the backfill material comprises material excavated previously by the mining machine.

62. The method of Claim 61, wherein the *in situ* hydrocarbon-containing material is consolidated before the passing step.

63. The method of Claim 61, wherein the backfill material is unconsolidated after the placing step.

64. The method of Claim 61, wherein a cross-section of the tunnel of reduced cross-sectional area is no more than about 20% of a cross-section of the portion of the excavation before backfilling.

65. The method of Claim 1, wherein the mining machine is a tunnel boring machine.

66. The method of Claim 1, wherein the mining machine is a tunneling machine.

67. The method of Claim 1, wherein the mining machine is a continuous mining machine.

68. The method of Claim 8, wherein the mining machine is a tunnel boring machine.

69. The method of Claim 8, wherein the mining machine is a tunneling machine.

70. The method of Claim 8, wherein the mining machine is a continuous mining machine.

71. The method of Claim 17, wherein the mining machine is a tunnel boring machine.

72. The method of Claim 17, wherein the mining machine is a tunneling machine.

73. The method of Claim 17, wherein the mining machine is a continuous mining machine.

74. The method of Claim 21, wherein the mining machine is a tunnel boring machine.

75. The method of Claim 21, wherein the mining machine is a tunneling machine.

76. The method of Claim 21, wherein the mining machine is a continuous mining machine.

77. The method of Claim 27, wherein the mining machine is a tunnel boring machine.

78. The method of Claim 27, wherein the mining machine is a tunneling machine.

79. The method of Claim 27, wherein the mining machine is a continuous mining machine.

80. The method of Claim 58, wherein the segmented mining machine is a tunnel boring machine.

81. The method of Claim 59, wherein the segmented mining machine is a tunneling machine.

82. The method of Claim 59, wherein the segmented mining machine is a continuous mining machine.

83. An underground mining method, comprising:

excavating *in situ* oil sands in an underground excavation;

extracting a hydrocarbon from the excavated oil sands to form tailings; and

backfilling at least a portion of the underground excavation with at least a portion of the tailings to define a trailing passage.

84. The method of Claim 83, wherein the excavating step is performed using a shielded mining machine.

85. The method of Claim 84, wherein the shielded mining machine is a tunnel boring machine.

86. The method of Claim 84, wherein the shielded mining machine is a tunneling machine.

87. The method of Claim 83, wherein an area of a cross-section of the tracking passage is no more than about 30% of an area of a cross-section of the at least a portion of the excavation before back filling.

88. The method of Claim 83, wherein the backfilled tailings are unconsolidated.

89. The method of Claim 84, wherein the shielded mining machine comprises a movable shield under which a tunnel liner in the tracking passage is formed.

90. The method of Claim 84, wherein the extracting step is performed in the shielded mining machine.

91. The method of Claim 84, further comprising, hydrotransporting the extracted hydrocarbon to a surface processing facility.

92. The method of Claim 89, wherein the backfilled tailings are located around at least a portion of an exterior periphery of the liner and between the exterior periphery and a surface of the underground excavation.